What is claimed is:

1. A spectrometer system for performing spectroscopic determination on biological media, the spectrometer system comprising:

a light source for generating light;

an optical filter positioned to receive light from the light source, the filter having a plurality of bandpass regions, wherein light within a bandpass region is transmitted through the filter;

an optical encoding unit positioned for encoding selected frequencies of light passing through the optical filter;

a sampler for transmitting the light into the sample and for receiving the non-absorbed light from the sample; and

a detector for receiving the non-absorbed light and for generating an electric signal indicative of the non-absorbed light.

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2. A spectrometer system as in claim 1, further comprising an optical filter that substantially reflects light when the incident light is of a wavelength outside the bandpass region. interpret broadly (could be absorbed)

3. A spectrometer system as in claim 2, further comprising an optical integrating chamber wherein light reflected from the optical filter is substantially directed into the chamber and then reflected back to the optical filter.

int. sphere

4. A spectrometer system as in claim 3, wherein the spectrometer system has a signal-to-noise ratio, and wherein the integrating chamber increases the signal-to-noise ratio.

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5. A spectrometer system as in claim 4, wherein the integrating chamber allows direct illumination of the filter from the light source.

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6. A spectrometer system as in claim 5, wherein the integrating chamber is an orthogonal design to preserve angular qualities of the light entering the integrating chamber.

orthogonal WITH integrating

7. A spectrometer system as in claim 3, wherein the light source is disposed inside the integrating chamber.

8. A spectrometer system as in claim 3, wherein the light source is disposed outside the integrating chamber.

9. A spectrometer system as in claim 1, wherein the sampler is disposed adjacent the detector.

10. A spectrometer system as in claim 1, wherein the sampler is disposed adjacent the light source.

11. A spectrometer system as in claim 1, wherein the optical filter is disposed adjacent the light source.

12. A spectrometer system as in claim 1, wherein the optical encoding unit is disposed adjacent the light source.

13. A spectrometer system as in claim 1, wherein the optical filter comprises one or more dielectric bandpass filters.

14. A spectrometer system as in claim 13, wherein the optical filter comprises a linear variable filter.

15. A spectrometer system as in claim 13, wherein the optical filter comprises a non-linear variable filter.

16. A spectrometer system as in claim 1, wherein the optical filter comprises a plurality of individual bandpass filters.

17. A spectrometer system as in claim 1, wherein the optical bandpass filters are embodied in optical fibers.

18. A spectrometer system as in claim 1, wherein the optical filter comprises a circular variable filter.

19. A spectrometer system as in claim 1, wherein the encoding unit comprises a spatial light modulator.

20. A spectrometer system as in claim 19, wherein the encoding unit comprises a rotary mask having an aperture array.

21. A spectrometer system as in claim 19, wherein the encoding unit comprises a linear translation mask having an aperture array.

22. A spectrometer system as in claim 19, wherein the encoding unit comprises a liquid crystal spatial light modulator.

23. A spectrometer system as in claim 19, wherein the encoding unit comprises a micro-electromechanical system.

24. A spectrometer system as in claim 23, wherein the individual micro-apertures are controllable to be either substantially transmissive or opaque.

25. A spectrometer system as in claim 23, wherein the individual micro-apertures are controllable to be either an optical bandpass filter or opaque.

26. A spectrometer system as in claim 23, wherein the individual micro-apertures are controllable to be one of a plurality of optical bandpass filters.

27. A spectrometer system as in claim 1, wherein the encoding unit comprises a digital mirror device.

28. A spectrometer system as in claim 1, wherein the optical filter and the encoding unit are combined into a single unit.

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29. A spectrometer for use in a spectroscopic system, the spectroscopic system including a light source for generating light and a detector for receiving light, the spectrometer comprising:

an optical filter for receiving light from the light source, the filter having a plurality of bandpass regions, wherein light within a bandpass region is transmitted through the optical filter; and

an encoding unit for encoding selected frequencies of light passing through the optical filter.

30. A spectrometer as in claim 29, further comprising an optical filter that substantially reflects light when the incident light is of a wavelength outside the bandpass region.

31. A spectrometer as in claim 30, further comprising an optical integrating chamber wherein light reflected from the optical filter is substantially directed into the chamber and then reflected back to the optical filter.

32. A spectrometer as in claim 31, wherein the spectrometer has a signal-to-noise ratio, and wherein the integrating chamber increases the signal-to-noise ratio.

33. A spectrometer as in claim 32, wherein the integrating chamber allows direct illumination of the filter from the light source.

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34. A spectrometer as in claim 33, wherein the integrating chamber is an orthogonal design to preserve angular qualities of the light entering the integrating chamber.

35. A spectrometer as in claim 29, wherein the optical filter is disposed adjacent the light source.

36. A spectrometer system as in claim 29, wherein the optical encoding unit is disposed adjacent the light source.

37. A spectrometer as in claim 29, wherein the optical filter comprises one or more dielectric bandpass filters.

38. A spectrometer as in claim 37, wherein the optical filter comprises a linear variable filter.

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39. A spectrometer as in claim 37, wherein the optical filter comprises a non-linear variable filter.

40. A spectrometer as in claim 37, wherein the optical filter comprises a plurality of individual bandpass filters.

41. A spectrometer as in claim 40, wherein the bandpass optical filters are embodied in optical fibers.

42. A spectrometer as in claim 37, wherein the optical filter comprises a circular variable filter.

43. A spectrometer as in claim 29, wherein the encoding unit comprises a spatial light modulator.

44. A spectrometer as in claim 43, wherein the encoding unit comprises a rotary mask having an aperture array.

45. A spectrometer as in claim 43, wherein the encoding unit comprises a linear translation mask having an aperture array.

46. A spectrometer as in claim 43, wherein the encoding unit comprises a liquid crystal spatial light modulator.

47. A spectrometer as in claim 43, wherein the encoding unit comprises a micro-electromechanical system.

48. A spectrometer as in claim 47, wherein the individual micro-apertures are controllable to be either substantially transmissive or opaque.

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49. A spectrometer as in claim 47, wherein the individual micro-apertures are controllable to be either an optical bandpass filter or opaque.

50. A spectrometer as in claim 47, wherein the individual micro-apertures are controllable to be one of a plurality of optical bandpass filters.

51. A spectrometer as in claim 29, wherein the encoding unit comprises a digital mirror device.

52. A spectrometer as in claim 29, wherein the optical filter and the encoding unit are combined into a single unit.

53. A spectrometer for use in selected applications of a spectroscopic system, the spectroscopic system including a light source for generating light and a detector for receiving light, the spectrometer comprising:

an optical filter for receiving light from the light source, the filter having a plurality of bandpass regions, wherein light within a bandpass region is transmitted

through the optical filter wherein said regions are sized from final regression coefficients derived from said selected application; and

an encoding unit for encoding selected frequencies of light passing through the optical filter.

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54. A spectrometer for use in a spectroscopic system, the spectroscopic system including a light source for generating light and a detector for receiving light, the spectrometer comprising:

an encoding unit for encoding selected frequencies of light, said encoding unit including an array of micro-apertures, each selectively including an optical filter thereon having a selected bandpass region, wherein light received from the light source within the selected bandpass region of a particular optical filter is transmitted therethrough.

55. A spectrometer system as in claim 54, wherein the encoding unit comprises a micro-electromechanical system.

56. A spectrometer system as in claim 55, wherein the individual micro-apertures are controllable to be either an optical bandpass filter or opaque.

57. A spectrometer system as in claim 55, wherein the individual micro-apertures are controllable to be one of a plurality of optical bandpass filters.

58. A spectrometer system for performing spectroscopic determination on biological media, the spectrometer system comprising:

a-light source for generating light;

a first optical filter positioned to receive light from the light source, the filter having a plurality of bandpass regions, wherein light within a bandpass region is transmitted through the filter;

an optical encoding unit positioned for encoding selected frequencies of light passing through the optical filter;

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a second optical filter positioned to receive light from the optical encoding unit, the second optical filter having bandpass regions matching the first optical filter;

a sampler for transmitting the light into the sample and for receiving the non-absorbed light from the sample; and

a detector for receiving the non-absorbed light and for generating an electric signal indicative of the non-absorbed light.

59. A spectrometer system as in claim 58, further comprising a first optical integrating chamber wherein light reflected from the first optical filter is substantially directed into the chamber and then reflected back to the optical filter.

60. A spectrometer system as in claim 59, further comprising a second optical integrating chamber having an exit port operatively connected to the sampler, wherein light transmitted through said second filter which does not go through said exit port is reflected back.

61. A method for performing spectroscopic determinations on biological media, said method comprising the steps of:

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collecting a set of data on an encoded variable filter spectrometer; and

applying the determination algorithm to the encoded data directly without first performing an inverse encoding step.

end

62. The method of claim 61, wherein said data are collected with a double-encoded spectrometer system.